

Valuing the impact of harmful algal blooms on Lake Erie beaches

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Excess Nutrients Threaten Lake Erie

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Photo: tripadvisor, cwlee

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Two objectives:

1. Estimate trips to Lake Erie beaches and the loss in economic value from beach closures

- Previous studies on Lake Erie beach values are limited or outdated (*Sohnngen et al., 1999*)
- We don't have a current study specific to Lake Erie

2. Evaluate ways to transfer estimates and models from other studies to Lake Erie

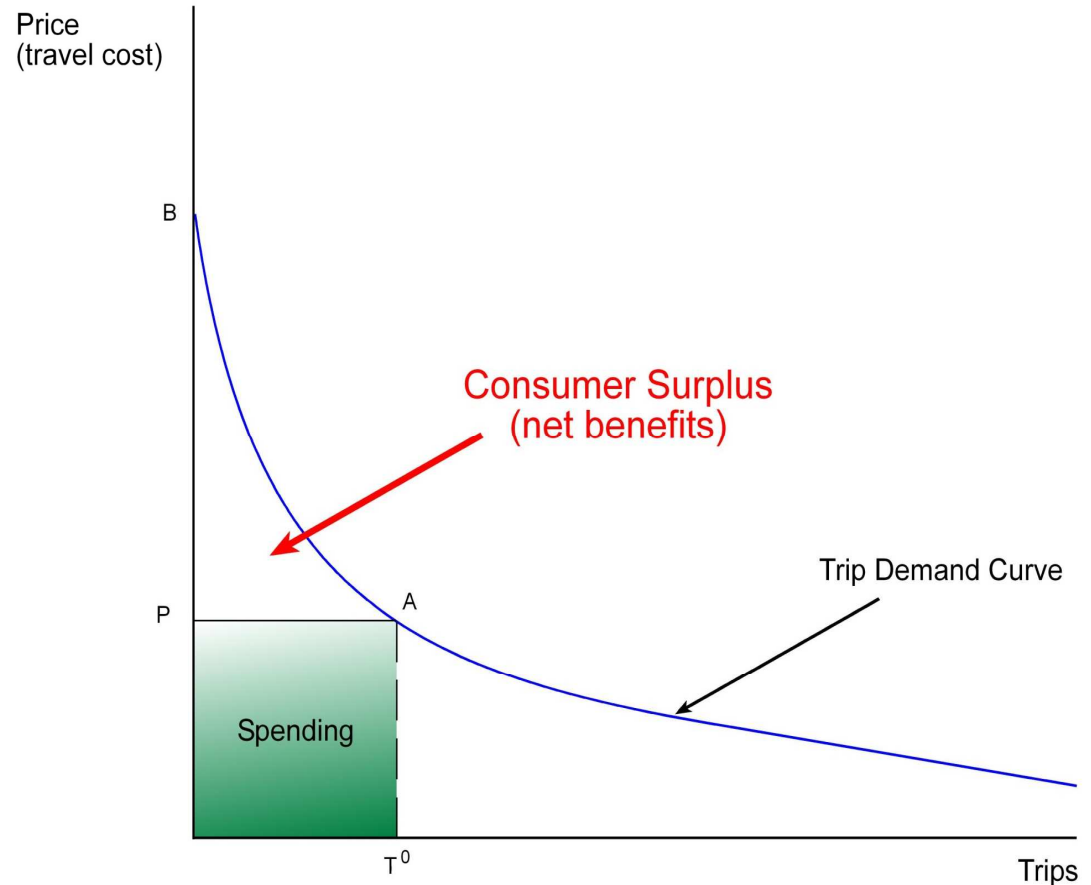
- Use a relatively new study from Michigan (*Chen et al, 2013*)



What kind of economic value?

Value *TO* the beachgoers

- Net economic benefit to beachgoers
- *Willingness to Pay* minus what they spend
- Not measuring spending and what happens to it
- Spending is a cost to beachgoers



Function vs. Value Transfer

- **Benefit transfer** – using values estimated at a “study site” to evaluate similar change at “policy site”
 1. Just multiply: $\text{Transfer value} \times \text{trips to Lake Erie beach}$
 2. Use a model: Transfer demand functions
- **Function transfer is generally favored over value transfer**



Benefit Function Transfer

Chen, Min. 2013. *“Valuation of Public Great Lakes Beaches in Michigan.”*
Dissertation. Michigan State University.

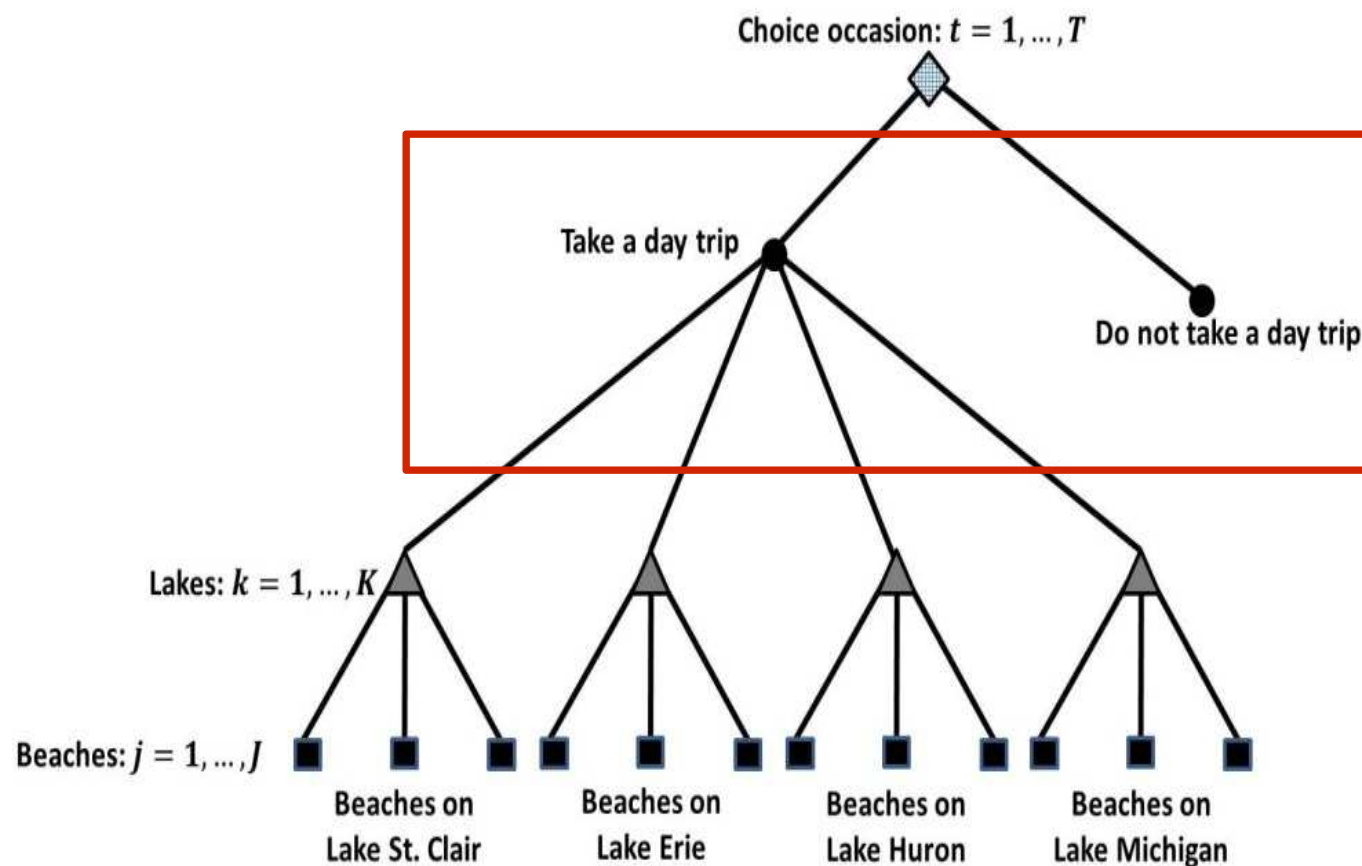


Figure 1. Repeated nested logit model

Benefit Function Transfer

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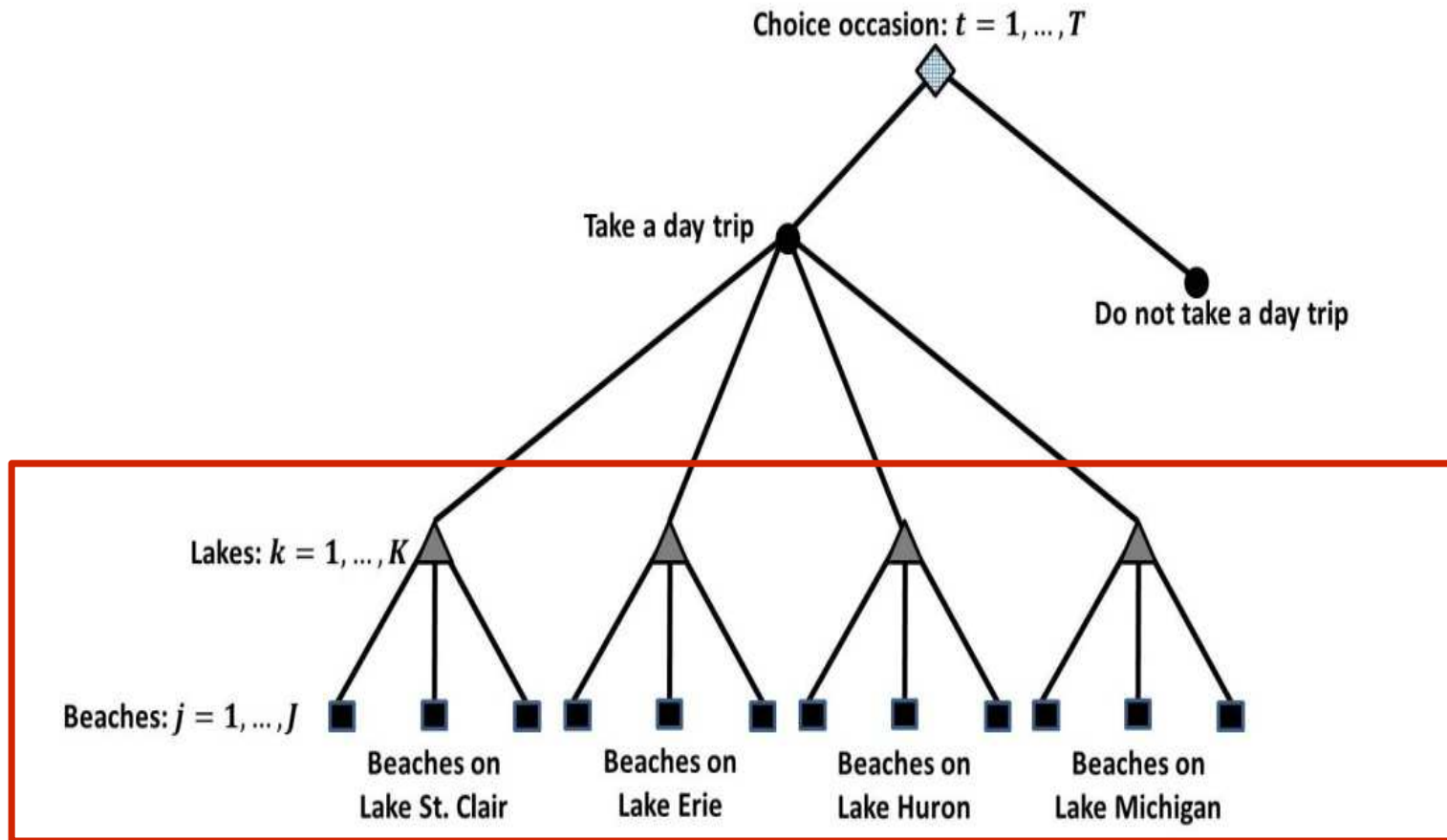


Figure 1. Repeated nested logit model

Benefit Function Transfer

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Trips and site choices depend on:

1. Travel costs to sites
2. Water temperatures
3. Previous closures (stigma)
4. Beach length
5. Other controls (fixed effects)

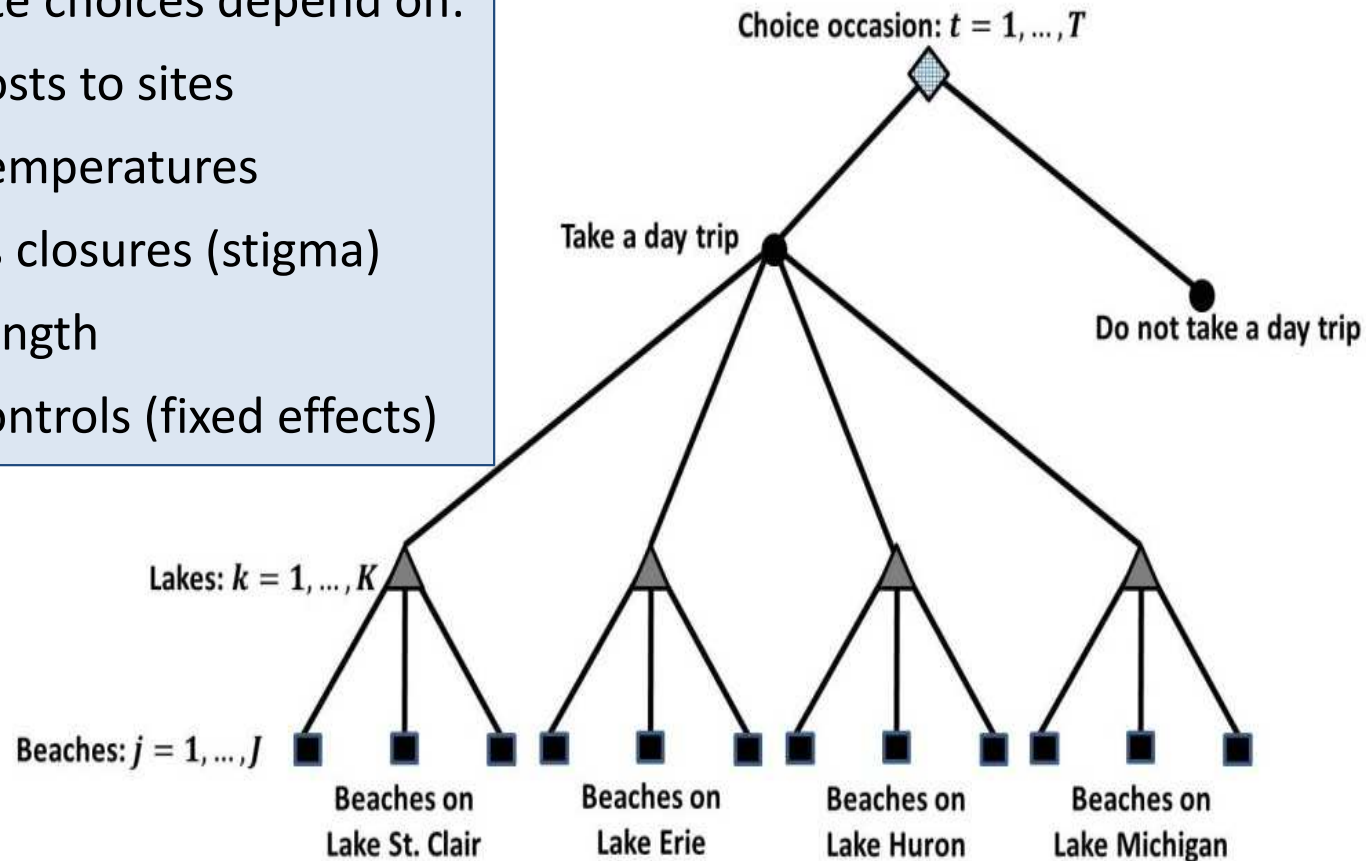
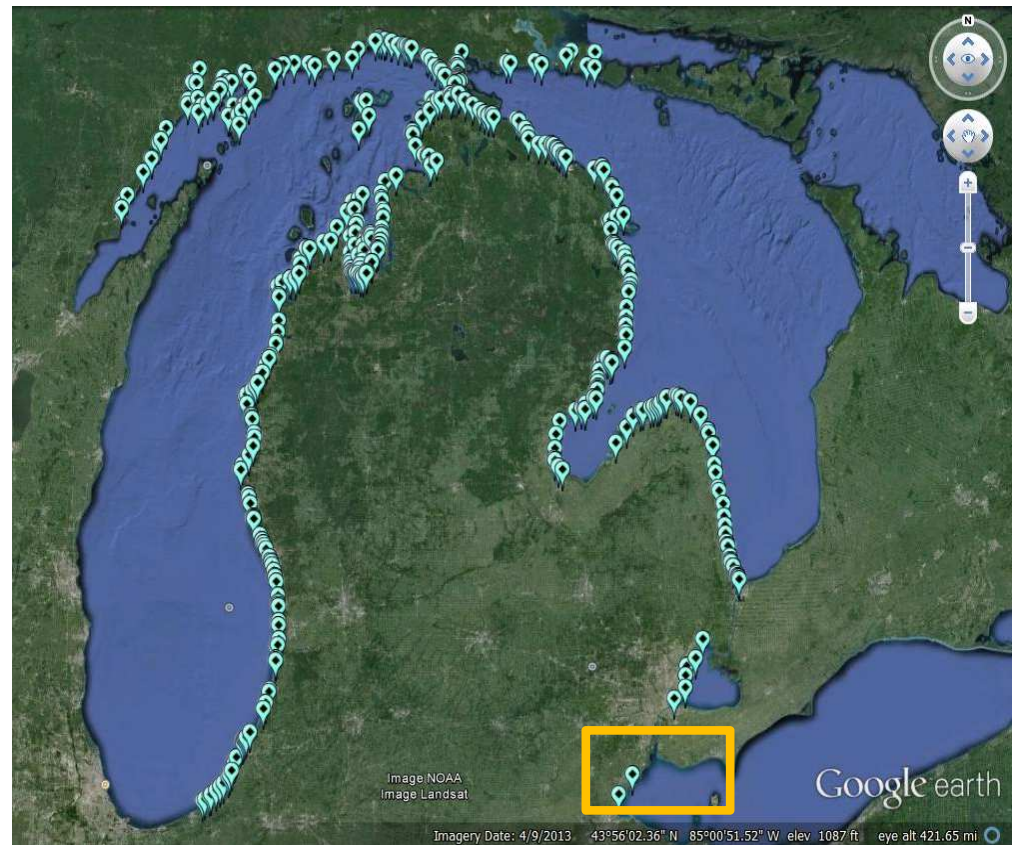


Figure 1. Repeated nested logit model

Study Sites

- 451 Beaches in Michigan
- Population: Michigan residents
- Valuing single day trips



Source: Chen, 2013

Policy Sites

Transfer the model functions

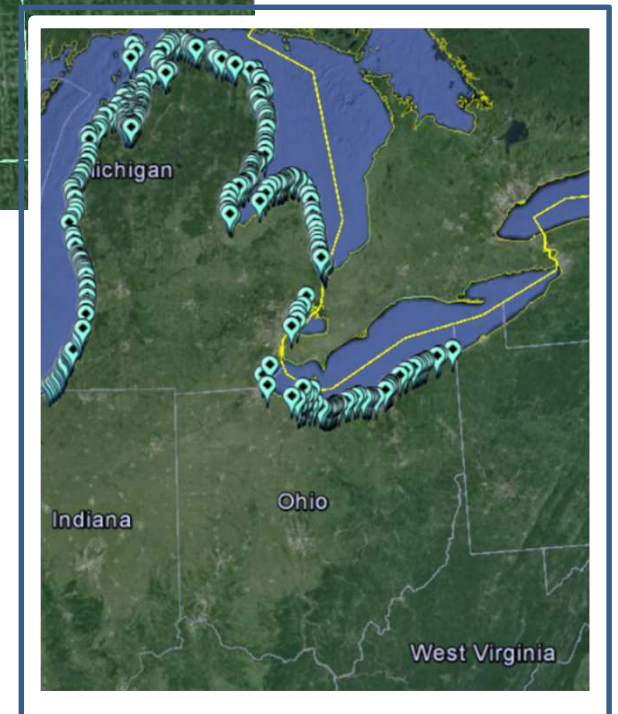
- 424 beaches in Ohio & Michigan
- Population: Ohio residents and some residents of Michigan and Indiana.
- Predict single day trips
- Value single day trips



The Full Choice Set – 424 beaches



Average choice set → 162 beaches.

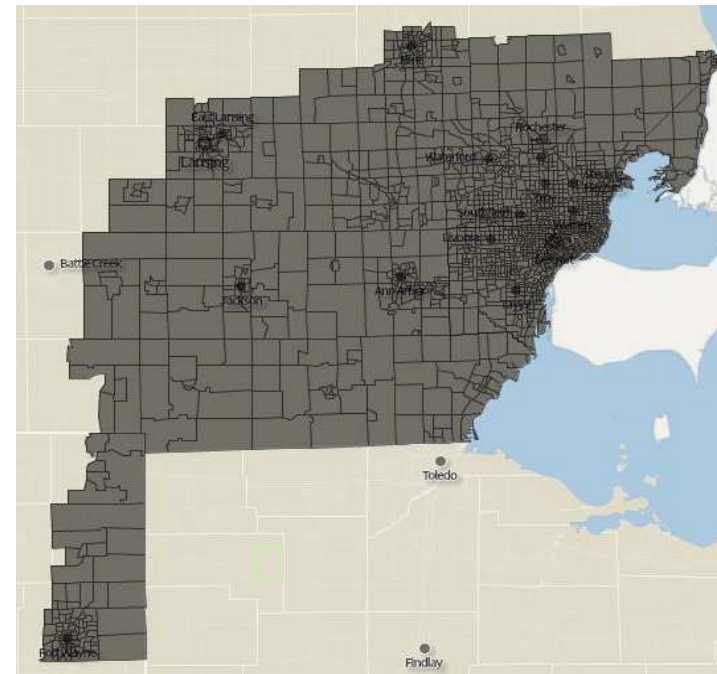


Identifying the population of beachgoers

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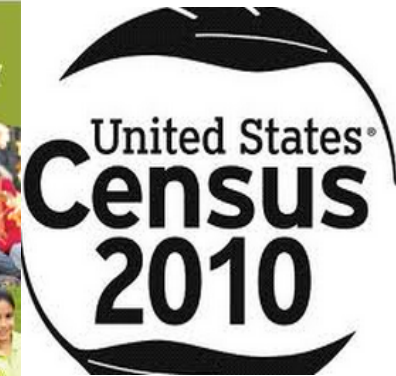


**4740 Census tracts in OH,
IN, and MI**



Population data

- Probability of taking a trip to the beach
- Demographic data required:
 - Gender
 - Age
 - Race
 - Education
 - Employment
 - Children under 17



Steps in benefit transfer

1. **Predict baseline day trips** to all beaches
2. **Predict how day trips change** to beaches when HABs cause closures at one or more beaches.
3. **Estimate loss** of the beach closures (i.e., economic losses to the beachgoers).



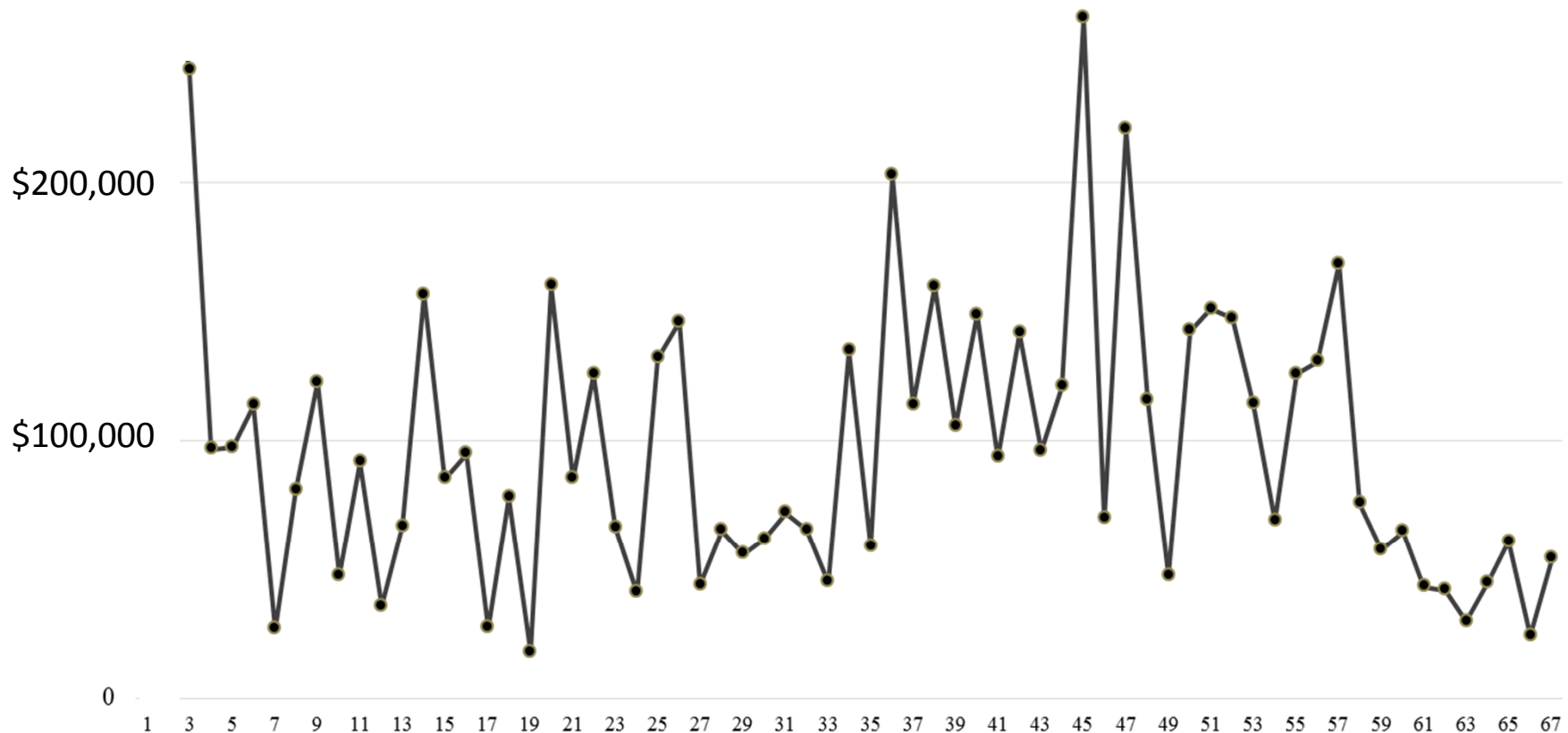
Economic Values from Transfer Approach

- Typical day trip to Lake Erie beaches worth about \$16 to \$18 per trip
- Day trips to typical Western Lake Erie beach worth about \$2 million per summer season
- These are economic values to the beachgoer



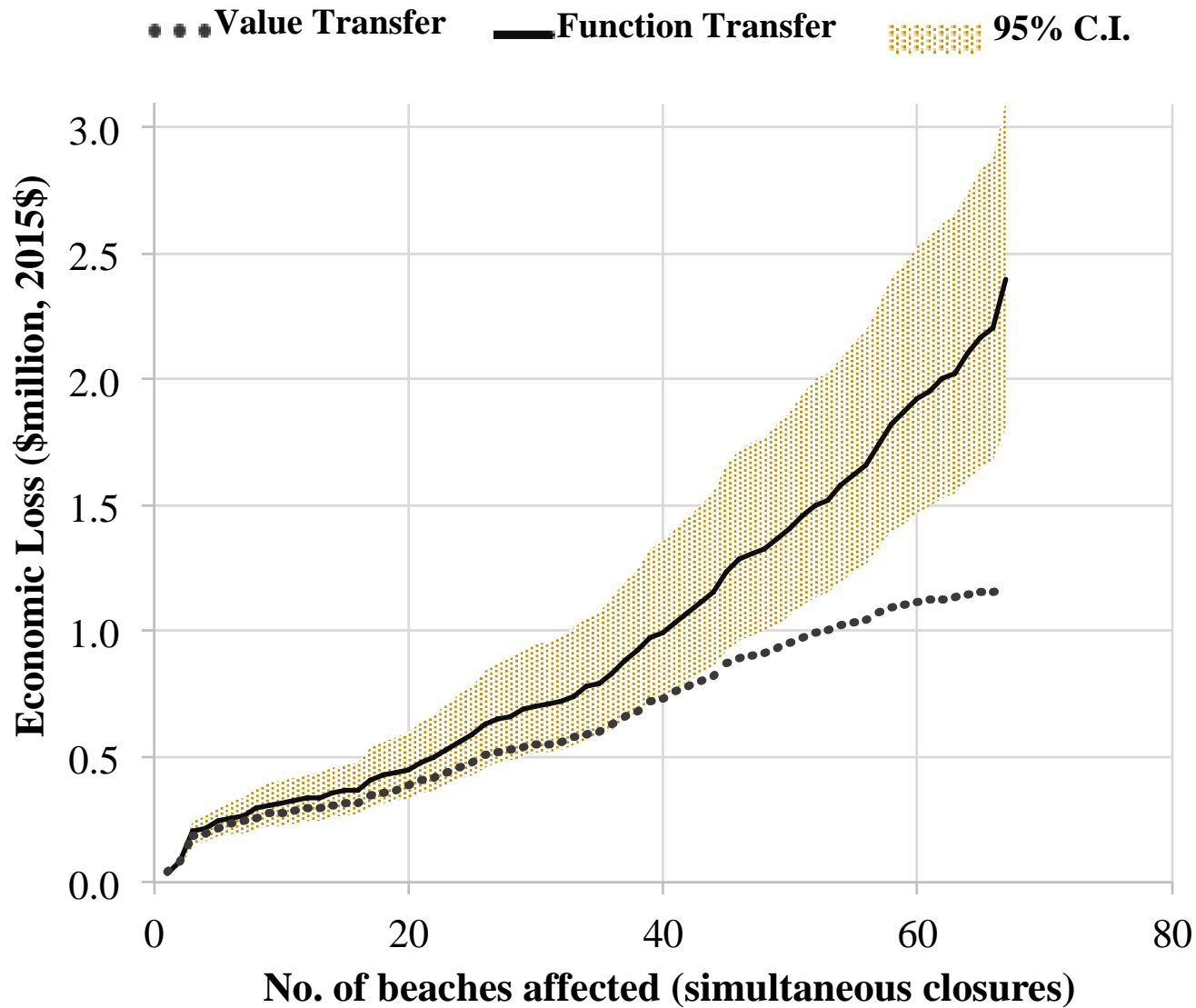
Values for Individual Beaches

Estimated economic losses to beachgoers from one-week closures at individual beaches



Lake Erie beaches in Ohio

Values If Multiple Beaches Close



Summary (we'd rather have all the data, but...)

- No Lake Erie model & No complete beach use data
- Applied a model from MI to Lake Erie sites to get trips and value of beaches (day trips only)
- Function transfer was essential to estimate trip demand and trip responses.
- Scale of closures nonlinearly affects losses per trip
 - Results from the two transfer methods deviated nonlinearly as scale of closures increased.



Thanks to partners & supporters

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The Nature
Conservancy 

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Protection Fund

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